

Benefits of AFV Emissions Reductions

by

Danilo J. Santini

Center for Transportation Research

Argonne National Laboratory

Argonne, IL 60439

phone: (630) 252-3758

e-mail: dan_santini @ qmgate.anl.gov

presented to the

National Clean Cities Conference

June 1-3, 1998

Washington, DC

Emissions Reductions Vary by Type of Fuel Switch: Trade-Offs Often Exist and Must Be Addressed

Type of Fuel Switch	Reactive Hydrocarbons	Nitrogen Oxides	Particulates	Greenhouse Gases	Vehicle Cost	Fuel Cost
Natural Gas for Gasoline	+++	++/-	+	+/-	-	+
Natural Gas for Diesel	+	++++	++++++	+/-	-	+/-
Electric for Gasoline	+++	+++	++	+++/-	---	+
LPG for Gasoline	++	-	+	+	-	+
LPG for Diesel	+	+++	++++++	+/-	-	+/-
E85 for Gasoline	+/-	+	+	++	neutral	--

Green is good, dark green better: Red is bad, dark red worse: Clear is uncertain

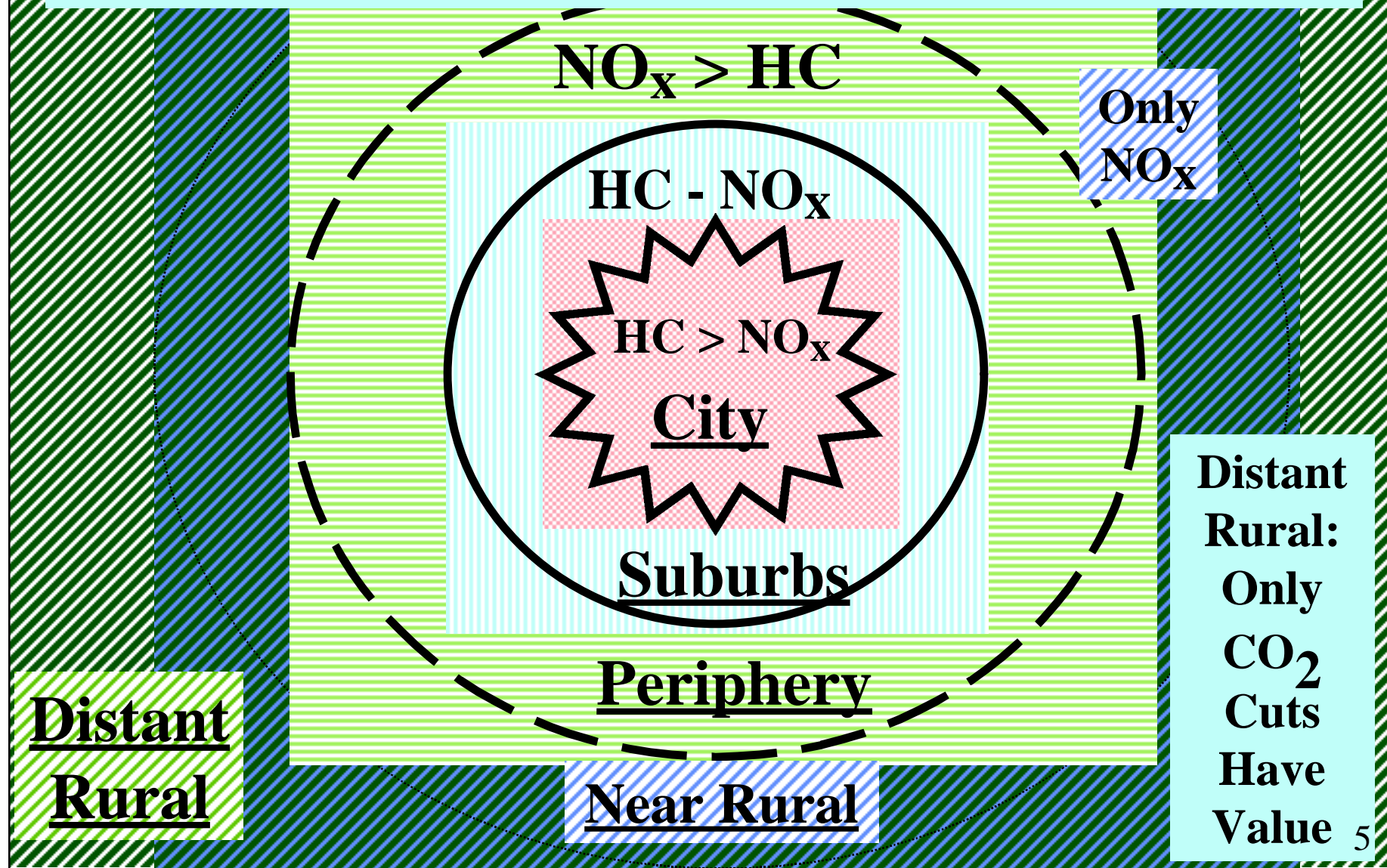
It is Important to Distinguish “Real” and Regulated Emissions Benefits

- **Regulated (Ozone 1 hr)**
 - Can be turned into \$
 - Are best that can be done, given politics and limited knowledge
 - Are specified by written rules and procedures
 - Will change when regulation is seen to fail to reach real goals
 - Require near-term actions
- **Real(Ozone 8 hr, Fine PM, Greenhous Gases)**
 - Are imperfectly known
 - Require modeling to estimate
 - Exist regardless of regulation
 - Are also in the mind of the beholder
 - As perceived, cause regulations to be set: As evolved, cause revisions

Regulations Cause Emissions Reductions to Have a Dollar Value to Someone

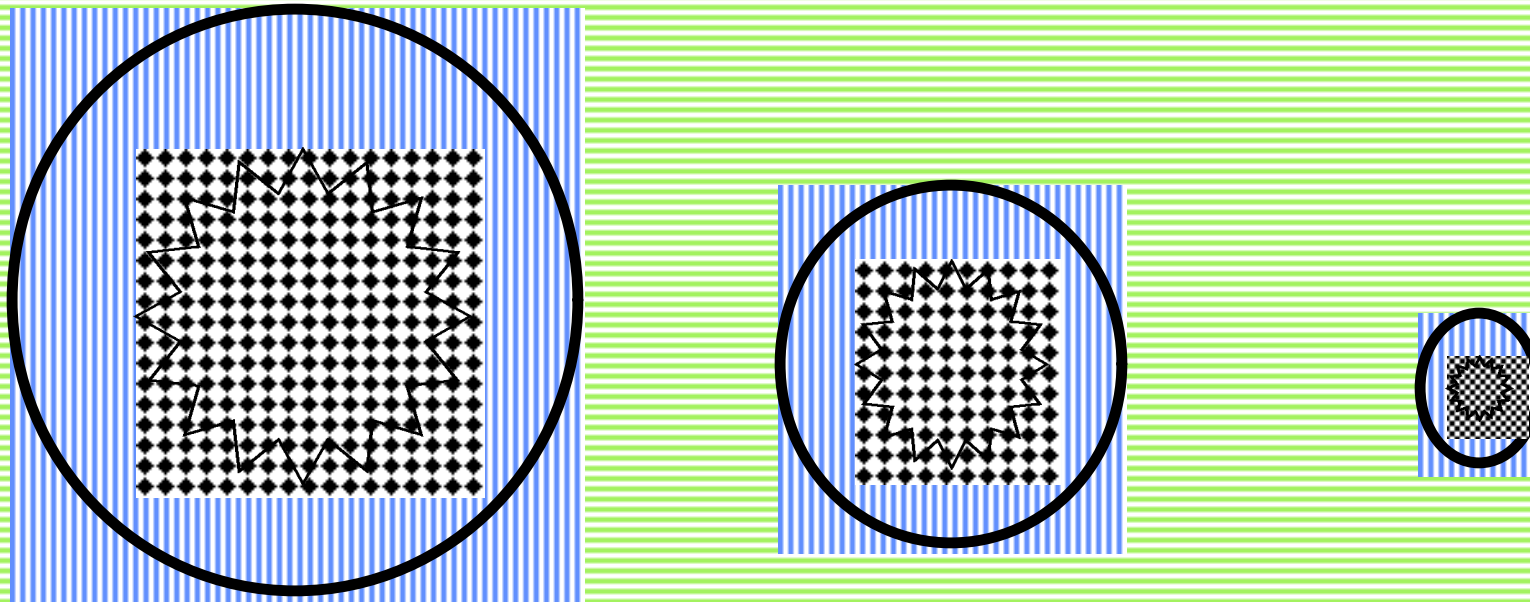
- **Present One Hour Ozone Standards Still Have to Be Met, Require HC and NO_x Cuts**
- **New Eight Hour Ozone Standards May Increase the Geographic Extent of Places Where Emission Cuts Have Value, Especially NO_x**
- **Fine Particulate Matter (PM) is Theoretically Far More Valuable to Reduce than Present Coarse PM Regulations Require, but New PM Nonattainment Areas will not be Determined for a Few Years**
- **Many More Locations Violate Present Ozone Standards than Violate Present PM Standards**
- **Greenhouse Gases are Not Regulated**

To Reduce Ozone, the “Real” Value of Vehicle Emissions Reduction Changes by Location

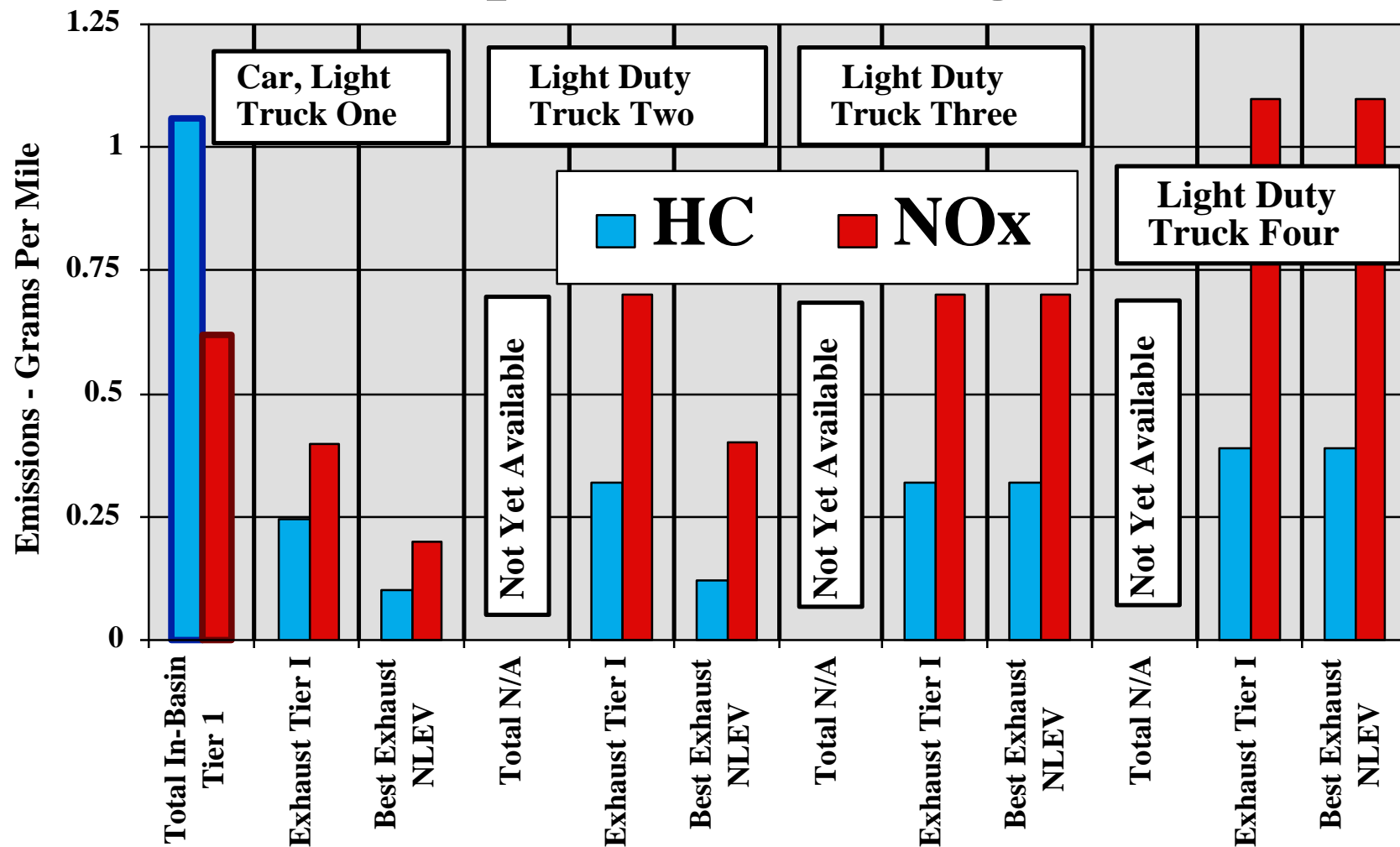


**\$ Value of
Emissions Cuts**

**Usually, the Larger the Metro
Area, the Larger the Criteria
Emissions Reduction Benefit**



Since Larger Vehicles are Allowed to Emit More, Fixed Percentage Reductions are Worth More in Pickup Trucks and Big SUVs (LDT4)



Clean Cities & Alternative Fuels are in Their Infancy - Not a Large Market Yet

- EPA Cannot Spend Same \$ on Clean Fuels as on Gasoline
- Yet Regulations Have to be Met
- EPA Tools Now Used for Gasoline & Diesel are far less Accurate When Applied to AFVs
- “Catch 22” Can Hinder AFV Introduction
- Insistence on Emissions Performance Being Better Than Gasoline in All Respects Can Hinder AFVs - Air Quality is the Issue, not Emissions

Work Is Underway on Emissions Reduction Benefit Quantification by Vehicle Size Class

- **EPA to Add CNG to its Mobile Emission Model**
- **EPA VMEP Ozone Program Can Accept All Fuels, Subject to Quantification Method Approval**
- **TRB/DOE/EPA Summer Workshop Aug. 2-4 to Discuss Fuels Attributes, EPA Procedures**
- **DOE/CCAP Partnering to assess cap & trade program**
- **DOE/OTT Supports “Localization” of National Models of CNGVs, EVs, Including:**
 - **Ozone Precursors (HC and NO_x), Fine PM**
 - **Greenhouse Gases**
 - **Oil Use Reduction**

Air Quality Standards are Evolving

- **A New 8-Hour Ozone Standard will Require New State Implementation Plans (SIPs), with New Modeling, Soon**
- **Clean Cities Programs Need to Make all Legitimate Claims for SIP Ozone Emissions Credit, Through State Agencies, Obtaining Approval by Regional EPA Offices, Soon**
- **5 Years of R&D Will Determine the Pervasiveness of Fine PM Problems: Present PM Reductions are “Anticipatory”, No Credits from EPA for a While**
- **Greenhouse Gas Reductions only Have Public Relations Value for Now, Regulation Least Certain**

Emissions Reductions Are Sometimes Needed In Areas Meeting Standards

- “Conformity” for Areas Near Air Quality Violations Requires Submissions to EPA Concerning an Emissions Budget for the Metro Area
- When a Metro Area Emissions Budget is Tight, Major New Construction Projects May Be Required to “Find” Emissions Cuts to Offset Construction Induced Increases

\$ Values of Emissions Reductions Depend on Location Where Emissions Occur and the Competing Gasoline Type Used in That Location

CNG (average fuel) or EV Compared to:	Quantity of Emissions Reduction	\$ Value /Ton of Emissions Reduction	\$ Value per Vehicle of Emissions Cut
California RFG	Least	Most	???
Federal RFG*	Intermediate	Intermediate	???
SE US Low RVP*	Intermediate	Intermediate	???
Other Gasolines	Most	Least	???

* Reductions vs. SE US Low RVP probably slightly better than vs. Federal RFG

Judgemental values, actual estimates have not been compiled.

As indicated, end results are not “intuitive”.

\$ Values of Emissions Reductions Depend on Location Where Emissions Occur and the Competing Gasoline Vehicle Type Used in That Location

CNG (average fuel) or EV Compared to:	Quantity of Emissions Reduction	\$ Value /Ton of Emissions Reduction	\$ Value per Vehicle of Emissions Cut
California Vehicles			
TLEV	Intermediate	High	High
LEV	Small	High	Intermediate
ULEV	Maybe None	High	Small-None
EZEV	Maybe None	High	Very Small to None
Federal Vehicles			
Tier 1 Cars and Small Trucks	Intermediate	Intermediate to None	Intermediate to None
NLEV Cars and Small Trucks	Small	High to None	Intermediate to None
Tier 1 Large Light Trucks	Highest	High to None	Highest to None

Judgemental values, actual estimates have not been compile. As indicated, end results will vary greatly by location.